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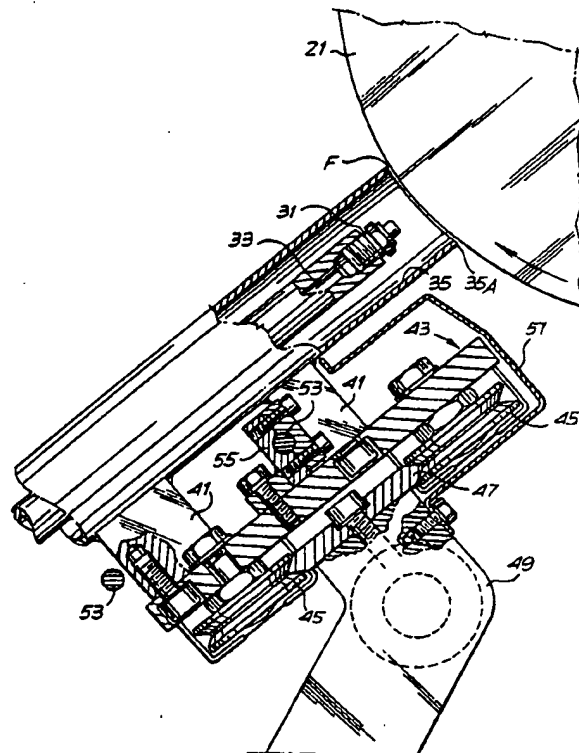
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Published*With international search report.**Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.***(54) Title:** DEVICE FOR CLEANING A CYLINDER OF A PRINTING PRESS AND PRESS CONTAINING SAID DEVICE**(57) Abstract**

In a flexographic printing press or the like - comprising a drum (3) around which the web (N) to be printed travels, and at least one plate cylinder (21) to which ink is applied for printing and from which said ink is transferred to the web (N) - a cleaning device (23) is provided for said plate cylinder; the device removes from said cylinder the impurities and ink residues deposited on it during printing, thus preventing harmful soiling that would affect the quality of the printing.



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DEVICE FOR CLEANING A CYLINDER OF A PRINTING PRESS AND
PRESS CONTAINING SAID DEVICE

DESCRIPTION

5 Technical field

This invention relates to a printing press, and in particular, but not exclusively, to a flexographic printing press, of the sort that comprises a drum around which the web to be printed travels, and at least one plate cylinder to which the ink is applied for printing, and from which the ink is transferred to the web which is to be printed.

Machines of this kind are often used for printing on paper, plastic films and the like in many areas of industry. They are also used for printing on tissue paper for making kitchen rolls, toilet rolls, serviettes, paper tissues and the like.

Background Art

In certain types of work to which flexographic printing presses are put, the substrate to be printed is not such as to cause soiling of the plate cylinder. This is the case, for example, with machines for printing on plastic films or glossy paper.

However, there are areas of application in which the web to be printed is a material that quickly leads to soiling of the plate cylinder. The problem occurs particularly with tissue paper for making kitchen rolls, toilet rolls and suchlike products. In such cases the plate cylinder or plate cylinders have to be cleaned periodically to avoid a build-up of dust which would degrade the quality of the printing.

At present the plate cylinder is cleaned in two ways. In one method the machine is stopped, the web is removed and the plate cylinder or cylinders are moved back from the impression cylinder or drum around which the substrate travels and are cleaned and dried by hand. After this the material to be printed is reintroduced into the press, the plate cylinders are moved back against the drum around which the substrate travels and production recommences.

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There are obvious drawbacks to this method, involving as it does stopping the entire production line for as long as it takes to clean the plate cylinders. There may be as many as four or six of the latter around the same drum, and this means the machine may be out of action for as long as an hour and a half.

A different cleaning method is to stop the machine, open the plate cylinders, remove the outer sleeves of the cylinders, clean and dry them and then put them back on the machine. Sometimes two series of identical plate sleeves are used, so that while one series is being cleaned and dried, the second series can be fitted to the machine, enabling production to continue. Either way, because the operations of opening the cylinders, removing and replacing the plates and getting the various cylinders back into phase are highly time-consuming, even in this method each washing operation interrupts the print run for around an hour or more.

Cleaning operations are relatively frequent and may be repeated several times in each shift. The loss in terms of output can therefore be large, because the paper processing lines that use these printing presses can have outputs of up to 1000 metres per minute.

Disclosure of the invention

The object of the invention is to overcome the shortcomings of conventional printing presses and in particular to eliminate machine stoppage during the cleaning of the plate cylinders or other cylinders where ink and/or residues of paper can build up, by providing each of the printing presses's cylinders that is to be cleaned with a cleaning device that removes the impurities deposited during printing (including paper dust and ink which may be partially dried) from said cylinder, without the need to remove the cylinder or its sleeve from said machine or to move it away from the adjacent drums or rollers.

Reference will be made below to, in particular, a flexographic printing press and its plate cylinders,

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since it is in this type of machine that the problem of soiling of the plate cylinder is particularly acute. However, the concept on which the invention is based can also be applied to other types of printing press, in which case the cleaning device may be fitted to a cylinder not in contact with the web.

In one especially advantageous embodiment, the cleaning device comprises a nozzle for spraying the plate cylinder with a cleaning liquid, typically water, and a suction member for sucking up the cleaning liquid and carrying it away from the surface of the plate cylinder together with any dirt removed from the surface of the cylinder, which is thus dried immediately after being cleaned.

In practice, the nozzle for spraying the cleaning liquid can be located inside the suction member, which may consist of, for example, a suction tube having a larger diameter than the outer diameter of the nozzle. In this way the liquid, sprayed at a comparatively high pressure from the nozzle onto the surface of the plate cylinder, is immediately evacuated, after having acted on the surface that is to be cleaned.

The cleaning device is advantageously mounted on a carriage that can move transversely relative to the direction of advance of the web and parallel to the plate cylinder. It is thus possible to clean the entire plate cylinder beginning at one end and moving the carriage towards the other end. The cleaning device can also be kept on one side of the press and brought into action when required by traversing the carriage from one end to the other of the plate cylinder. As it moves along, the device cleans and dries consecutive sections of the cylindrical surface of the plate cylinder.

Cleaning and drying can be carried out without stopping the machine. This is because the cleaning device is advantageously located adjacent to its plate cylinder downstream of the area of contact between the web being printed and the plate cylinder, with respect

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to the direction of rotation of the latter. In this way each portion of the plate cylinder is cleaned and dried before the ink is re-applied to the same area by the screened cylinder. It is therefore possible to clean
5 the plate cylinder without interrupting the print run. This is particularly advantageous in view of the fact that both the flexographic printing press and the parts positioned upstream and downstream of the press have high inertias and it is therefore always best to avoid
10 situations in which the line has to be stopped and then restarted.

If the carriage travel guide is integral with the supporting unit of its plate cylinder, the cleaning device can also operate with the plate cylinder in the
15 open position, i.e. moved away from the main drum, as the relative positions of the plate cylinder and the cleaning device are not affected.

Other advantageous features of the press according to the invention are indicated in the
20 appended claims.

The invention also relates to a device for cleaning the plate cylinders of a flexographic printing press or the like, comprising a nozzle for spraying said cylinder with a cleaning liquid and a suction
25 member that sucks up the cleaning liquid and dries said cylinder.

Other advantageous features of the device are indicated in the appended claims.

Brief description of the drawings

30 A fuller understanding of the invention will be provided by the description and accompanying drawing, the latter showing a practical, non-restrictive example of an embodiment of the invention. In the drawing:

Fig. 1 shows a schematic side view of a
35 flexographic printing press to which the device according to the invention is applied;

Fig. 2 shows an enlargement of one of the printing units of the machine of Fig. 1; and

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Fig. 3 shows an enlargement of the device for cleaning the plate cylinder.

Detailed description of the preferred embodiment of the invention

5 Fig. 1 schematically shows an example of a flexographic press to which this invention is being applied. The press, given the general reference numeral 1, comprises a drum 3 around the periphery of which a web N travels in the direction indicated by the arrow fN. The
10 numerals 5, 7 and 9 denote guide rollers on the web N feed side and the numerals 11 and 13 indicate the deflection rollers on the delivery side after the web has been printed.

Positioned around the main drum 3 are four
15 printing units bearing the general numerals 15A, 15B, 15C and 15D. The four units 15A, 15B, 15C and 15D are basically identical or symmetrical. Each has an ink distributor 17, of a type known per se, which distributes the ink on a transfer cylinder 19, which is
20 normally screened. The cylinder 19 then transfers the ink to the plate cylinder 21. From here the ink is applied to the web N as it travels around the main drum 3. The directions of rotation of the cylinders 19 and 21 are shown in Fig. 1 for each printing unit 15.

25 The structure of the flexographic press illustrated generally and schematically in Fig. 1 is typical of a central impression flexographic press. The present invention can nonetheless be applied to flexographic printing presses with a different
30 structure and with a different number of printing units. It can be applied in general to any type of printing press that has similar problems of dirt getting onto the plate cylinder.

Each printing unit 15A, 15B, 15C and 15D is
35 provided with a cleaning device, having the general references 23A, 23B, 23C and 23D for each printing unit 15A-15D. Fig. 1 shows clearly that the cleaning device 23 of each printing unit 15 is positioned, with respect to the direction of rotation of the plate cylinder,

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upstream of the area of contact between the cylinders 19, 21 and downstream of the area of contact between the cylinder 21 and the drum 3.

5 The cleaning devices 23A-23D are basically identical or symmetrical and only device 23C will be described below with reference to the enlargements shown in Figs. 2 and 3.

10 The cleaning device 23 comprises a nozzle 31 whose axis is approximately normal to the surface of the corresponding plate cylinder 21. The nozzle 31 is connected to a line 33 supplying water at pressure connected to a pump of sufficient flowrate and head. The water is typically supplied at a pressure of around 20-40 atmospheres and preferably between 30 and 35
15 atmospheres at a flowrate of from 1 to 10 l/min, preferably between 2 and 5 l/min. *.26 gpm 2.6 gal/min*

The nozzle 31 is housed coaxially inside a suction pipe 35 connected, via a flexible hose, to a vacuum source, not shown. The end 35A of the suction
20 pipe 35 is cylindrically shaped with a radius slightly greater than the radius of the corresponding plate cylinder 21, in order that the suction pipe 35 can be positioned close to the surface of the cylinder 21, while leaving a gap F of a few millimetres between the
25 mouth of the suction pipe 35 and the surface of the plate cylinder 21, for the purposes explained below.

The suction pipe 35 and the nozzle 31 which it houses are attached by means of rods 41 to a carriage 43. This carriage is guided by V-grooved wheels 45
30 along a guide 47 extending transversely relative to the machine 1, that is to say parallel to the axis of the corresponding plate cylinder 21. The guide 47 is at least as long as the cylinder 21 in order to enable the carriage 43, and hence the suction pipe 35 and nozzle
35 31, to execute a stroke that is as long as the entire plate cylinder 21.

The numeral 49 denotes generally a supporting structure for the guide 47 and for a casing 51 that

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extends the entire length of the guide 47 to protect this guide from drips of ink or cleaning water.

The structure 49 is advantageously integral with a supporting unit 50 for the plate cylinder 21. 5 The supporting unit 50 can move in the direction shown by the arrow f₅₀ to move the cylinder 21 away from the drum 3, that is to open the printing unit. The supporting unit 50 moves together with a supporting unit 52 for the screened cylinder 19. A movement of 10 mutual separation is provided between the two supporting units 50, 52 in order to separate the screened cylinder 19 from the plate cylinder 21.

When this system of assembly is adopted the cleaning device 15 always maintains the same position 15 relative to its plate cylinder 21, which can therefore be cleaned either while the machine is running (at production speed or reduced speed), or with the plate cylinder in an open position.

The carriage 43 is moved along the guide 47 by 20 means of a belt 53 fastened to the carriage 43 by a clamp 55 and passed around two pulleys (not shown) located at the sides of the press. One of the pulleys is motorized and thus transmits the drive to the carriage 43.

25 The plate cylinder 21 is cleaned by maintaining said cylinder in rotation and moving the carriage 43 at a suitable speed along the axis of the cylinder 21, while the nozzle 31 sprays water under pressure onto the cylindrical surface of the plate cylinder 21. The 30 vacuum generated inside the suction pipe 35 causes the cleaning liquid sprayed by the nozzle 31 and the dirt and ink residues detached from the surface of the cylinder 21 by the jet of liquid to be sucked into the pipe 35 and collected in a tank (not shown). The air 35 aspirated by the pipe 35 passes through the gap F between the mouth of the pipe 35 and the surface of the plate cylinder 21. The gap F is small, so that the velocity of the air in this through passage is extremely high. This means on the one hand that the

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water or other cleaning liquid does not escape to the outside, and on the other that the portion of the plate cylinder cleaned by the nozzle 31 is dried instantaneously. Consequently, the area of the plate
5 cylinder 21 over which the cleaning device 23 has passed emerges clean and dry. As a result, the cleaning device can be used while the press is running, without having to stop production. Alternatively, if desired, the carriage 43 can be arranged to remain on one side
10 of the press and be brought into action during a cleaning phase while the flexographic press is not printing, in which case there is still the advantage that the machine does not have to be opened and the web N withdrawn from the press. The time taken up in
15 cleaning is consequently reduced very greatly.

It will be understood that the drawing shows only an illustrative embodiment given purely by way of a practical demonstration of the invention, it being possible for said invention to be altered as regards
20 shapes and arrangements without thereby departing from the scope of the concept underlying said invention. The presence of any reference numerals in the accompanying claims is intended to facilitate the reading of the claims with reference to the description and drawing,
25 and does not limit the scope of protection represented by the claims.

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CLAIMS

1. Printing press comprising a drum (3) around which the web (N) to be printed travels, and at least one cylinder (21) to which ink is applied for printing
5 and from which said ink is transferred to said web (N) which is to be printed,
characterized in that said cylinder (21) is provided with a cleaning device (23) that removes from said cylinder the impurities deposited on it during
10 printing.
2. Machine according to Claim 1, characterized in that it is a flexographic printing press and in that said cylinder (21) is one of the plate cylinders of the flexographic printing press.
- 15 3. Machine according to Claim 1 or 2, characterized in that said cleaning device comprises a nozzle (31) for spraying said cylinder (21) with a cleaning liquid, and a suction member (35) for sucking up the cleaning liquid and carrying it away from the
20 surface of the cylinder (21).
4. Machine according to Claim 3, characterized in that said nozzle (31) is located inside said suction member (35).
5. Machine according to one or more of the
25 previous claims, characterized in that said cleaning device (23) is mounted on a carriage (43) that can move transversely along the axis of said cylinder.
6. Machine according to Claim 3, 4 or 5, characterized in that said suction member (35) is
30 positioned close to the surface of said cylinder (21), leaving a gap (F) between the suction member and said surface in order to suck air into said suction member from the outside.
7. Machine according to one or more of the
35 previous claims, characterized in that it comprises a plurality of cylinders (21A-21D) to be cleaned, distributed around said drum (3), each cylinder being equipped with its own cleaning device (23A-23D).

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8. Machine according to one or more of the previous claims, characterized in that said cleaning device (23) is located, with respect to the cylinder (21), upstream of the area of application of the ink to said cylinder and downstream of the area of transfer of the ink from said cylinder.

9. Machine according to Claim 3, characterized in that said nozzle (31) is supplied with a liquid at a pressure of approximately 20-40 atmospheres at a flowrate of approximately 1-10 l/min.

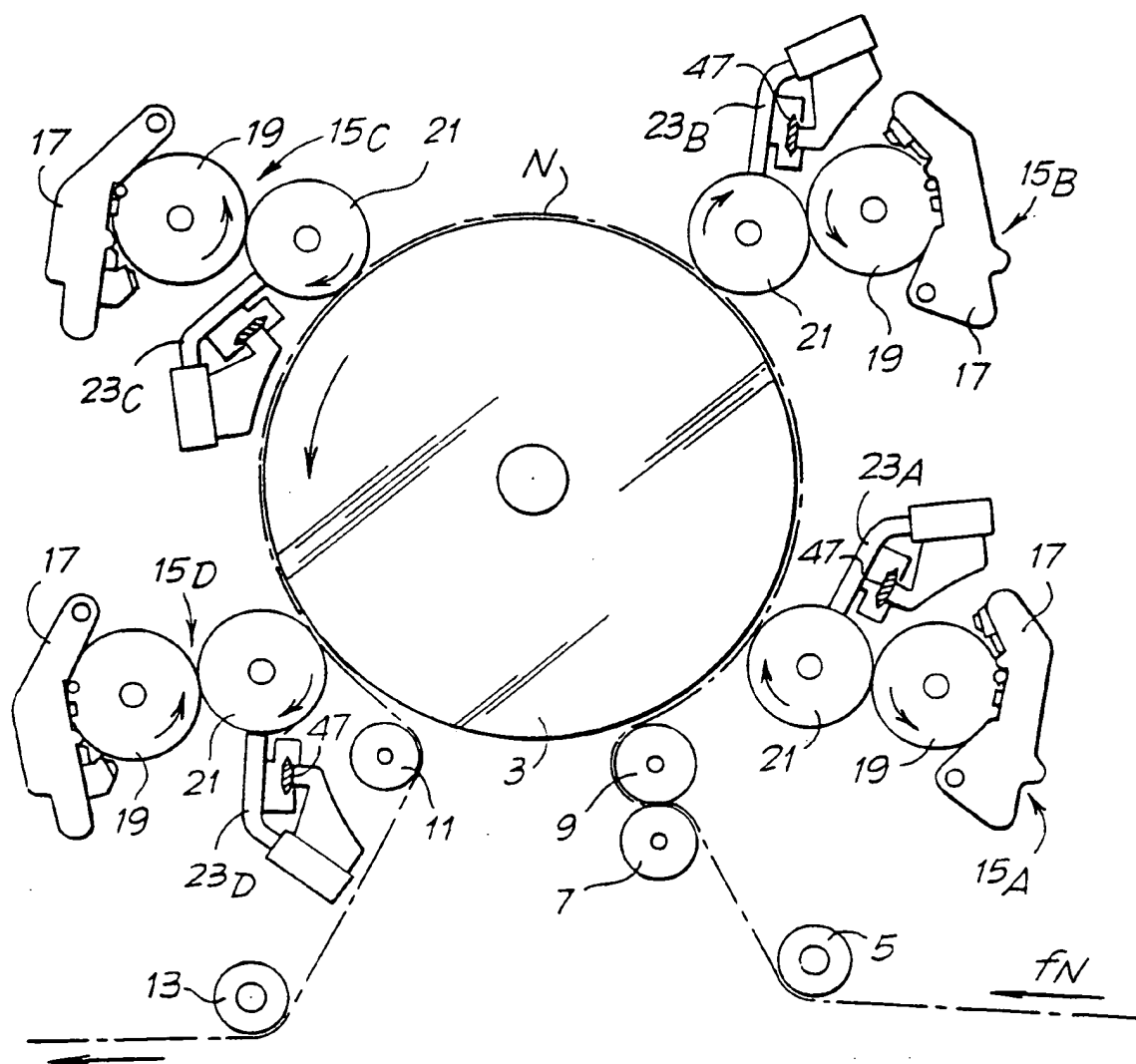
10. Machine according to Claim 5, characterized in that said cylinder (21) is mounted in a supporting unit (50) that can move with respect to the structure of the machine, and in that a guide (47) along which said traversing carriage (43) travels is integral with said supporting unit (50).

11. Device for cleaning a cylinder (21) of a printing press, comprising a nozzle (31) for spraying said cylinder with a cleaning liquid and a suction member (35) that sucks up the cleaning liquid from said cylinder (21).

12. Device according to Claim 11, characterized in that said nozzle (31) is located inside said suction member (35).

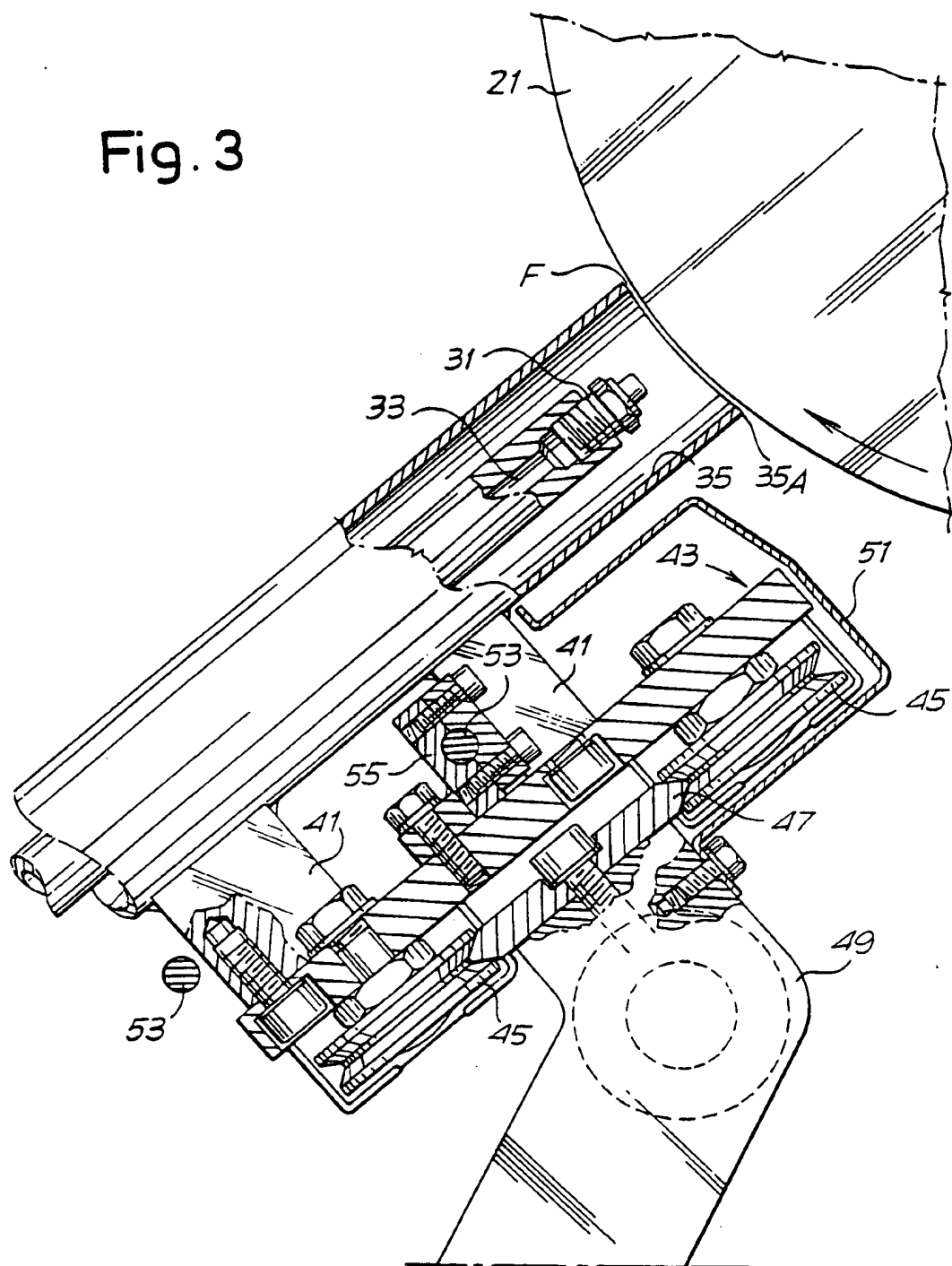
13. Device according to Claim 11 or 12, characterized in that it is equipped with a carriage (43) that can move parallel to said cylinder in order to clean successive portions of the surface of said cylinder (21).

Fig.1



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Fig. 3



INTERNATIONAL SEARCH REPORT

International application No.

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A. CLASSIFICATION OF SUBJECT MATTER

IPC6: B41F 35/02

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC6: B41F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO, A1, 9501876 (MASKINFABRIKEN TRESU A/S), 19 January 1995 (19.01.95), page 1, line 14 - line 22; page 4, line 30 - page 5, line 7, figures	1-3,5,7-8, 10-11,13
Y	---	4,6,9,12
Y	WO, A1, 9412349 (SJÖBERG, STAFFAN), 9 June 1994 (09.06.94), page 10, line 12 - line 26, abstract, figures	4,6,9,12



Further documents are listed in the continuation of Box C.



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INTERNATIONAL SEARCH REPORT

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Information on patent family members

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO-A1- 9501876	19/01/95	AU-A- 7121894 CA-A- 2165160 DK-A- 83193 FI-A- 960069 NO-A- 960072	06/02/95 19/01/95 10/01/95 06/03/96 08/01/96
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